10 - 10 - 00   *A*

Sir:

Transmitted herewith for filing is the Patent Application of

Inventor(s):   **Eric C. Anderson**

For: **TRANSMISSION BANDWIDTH AND MEMORY REQUIREMENTS REDUCTION
IN A PORTABLE IMAGE CAPTURE DEVICE**

Enclosed with the Patent Application are:

<div style="text-align:right">JC860 U.S. PTO
09/680612
10/06/00</div>

   _X_ Seven (7) sheets of Drawings
   _X_ Declaration and Power of Attorney
   _X_ Assignment and Recordation Form
   _ Information Disclosure Statement (PTO Form 1449)
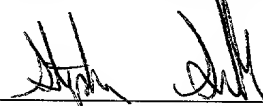   _X_ Self Addressed, Stamped Postcard

The filing fee has been calculated as shown below:

LARGE ENTITY

FOR:	NO. FILED	NO. EXTRA	RATE		FEE
BASIC FEE					$ 710.00
TOTAL CLAIMS	32 - 20	= 12	x 18	=	$ 216.00
INDEP. CLAIMS	4 - 3	= 1	x 80	=	$ 80.00
MULTIPLE DEPENDENT CLAIM PRESENTED			+270	=	$ 0.00
			TOTAL		**$ 1006.00**

   _X_ Check No. <u>2385</u> in the amount of **$ 1,006.00** is enclosed for payment of filing fees.
The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No.<u>02-2120</u> (Sawyer Law Group LLP).
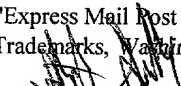
Respectfully submitted,

SAWYER LAW GROUP LLP
P.O. Box 51418
Palo Alto, California 94303
(650) 493-4540

Stephen G. Sullivan
Sawyer Law Group LLP
Attorney for Applicant(s)
Reg. No. 38,329

EXPRESS MAIL CERTIFICATE

    I hereby certify that the above paper/fee is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on **October 06, 2000**, and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231. "Express Mail" no.: **EL547856735US**. Signature of Person mailing paper/fee:

Stephen G. Sullivan

UNITED STATES PATENT APPLICATION

FOR

TRANSMISSION BANDWIDTH AND MEMORY REQUIREMENTS REDUCTION IN A PORTABLE IMAGE CAPTURE DEVICE

Inventor(s):
Eric C. Anderson

Sawyer Law Group LLP
2465 E. Bayshore Road, Suite 406
Palo Alto, California 94303

TRANSMISSION BANDWIDTH AND MEMORY REQUIREMENTS REDUCTION IN A PORTABLE IMAGE CAPTURE DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present invention is related to co-pending U.S. Patent Application Serial No. _____ entitled "Automatically Configuring A Web-Enabled Digital Camera To Access The Internet,"; and to co-pending U.S. Patent Application Serial No. _____ entitled "Method And System For Selecting Actions To Be Taken By A Server When Uploading Images," which are assigned to the assignee of the present application, which are herein incorporated by reference.

FIELD OF THE INVENTION

The present invention relates the storage and transmission of digital images, and more particularly to a method and system for reducing transmission bandwidth and storage requirements of an image capture device.

BACKGROUND OF THE INVENTION

As the popularity of digital cameras continues grow, the use of on-line photo sharing websites for storing and sharing digital images is becoming more prevalent. The most common method for getting the digital images to the photo sharing websites is to load the images from the digital camera to a personal computer (PC) and use the Internet connection on the PC to upload images to the photo site.

Today, however, hand-held electronic devices are emerging, including digital cameras that have the capability to connect directly to the Internet without the use

of the PC. For example, the assignee of the present application has developed an

approach to uploading images to the Web. In this approach, an e-mail software

application is loaded into a digital camera capable of running software applications

that allows the user to e-mail images directly from the camera. The user simply

5   connects his or her digital camera to a cell phone or a modem, runs the e-mail

application, and selects the desired images and e-mail recipients. The selected

images are then sent to the e-mail recipients as attachments.

A more advanced approach is to provide the digital camera with cell phone-

like functionality in which the camera establishes an Internet connection with the

10   photo sharing website by dialing an 800 number, for example, and automatically

uploads the images.

One prohibitive factor to the widespread adoption of digital imaging is cost.

Digital cameras are already relatively expensive to purchase, and providing digital

cameras with Internet connectivity for uploading images to the Internet will only add

15   to the expense. And ever increasing images sizes means that digital cameras will

require larger memories, further adding to the expense. What's more, consumers

will have to pay for the bandwidth consumed during transmission of images to the

photo- sharing site. The cost for transmitting images will be a function of the size

and number of the images, the speed of the modem or wireless medium, and the

20   cost of calling the 800 number.

One reason why digital cameras require so much transmission bandwidth is

because images stored on the digital camera are oftentimes transmitted over the

Internet more than once. For example, consider the example where the user wants

to send selected images to ten different work groups at work and selects the same image several times. The user may chose to send images 1, 2, and 8 to group 1, images 2, 5, 8 and 9 to group 2, images 3, 4, 8, and 10 to group, and so on. As can be seen, the same image (#8) must be transmitted over the Internet several

5   times, consuming a large amount of bandwidth.

One way to reduce the bandwidth used transmitting images from the camera is to reduce the size of the image files by using higher compression rates and/or by capturing lower resolution images. However, the digital camera industry is attempting to meet to consumer demand for digital image quality that rivals film

10   images, which may require image sizes of at least 4-10 MB. Using higher compression rates is not viable option because higher compression rates degrade image quality, and capturing lower resolution images is the antithesis of achieving film-quality.

Accordingly, what is needed is a method and system for reducing bandwidth

15   and storage requirements of images transmitted from a digital camera. The present invention addresses such a need.

SUMMARY OF THE INVENTION

The present invention provides a method and system for reducing storage

20   and transmission bandwidth requirements of a portable image capture device capable of establishing a communications connection on a network. In a first aspect of the present invention, a method is provided for reducing bandwidth requirements is provided by assigning an image identifier to captured images

uploaded to a server on a network. Thereafter, in response to a user request to apply an action to one of the uploaded images, only the image identifier of the image and the requested action are transmitted to the server. In a second aspect of the present invention, a method for reducing storage requirements is provided by reducing the size of each of the image files corresponding to the uploaded images on the image capture device.

According to the system and method disclosed herein, reducing the image files of each of the uploaded images after image uploading frees memory space for the capture of additional images and reduces storage requirements. And transmitting only the image identifier of the image after an image is uploaded the first time eliminates the need to retransmit the image, thereby reducing transmission bandwidth requirements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating an online photo-sharing system in accordance with a preferred embodiment of the present invention.

FIG. 2 is a diagram showing a preferred embodiment of a digital camera for use in accordance with the present invention.

FIG. 3 is a block diagram illustrating a diagram of one embodiment for an image file.

FIG. 4 is a flow chart illustrating the process for reducing storage and bandwidth requirements of the digital camera in accordance with a preferred embodiment of the present invention.

FIG. 5 is a flow chart illustrating the process for reducing storage and bandwidth requirements of the digital camera in capture mode in a preferred embodiment of the present invention.

FIG. 6 is a block diagram illustrating an example action list displayed on the LCD screen of the camera.

FIGS. 7A and 7B is a flow chart illustrating the process for reducing storage and bandwidth requirements of the digital camera in play mode.

DESCRIPTION OF THE INVENTION

The present invention relates to reducing the transmission bandwidth and storage requirements of a portable image capture device. The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiment will be readily apparent to those skilled in the art and the generic principles herein may be applied to other embodiments. Thus, the present invention is not intended to be limited to the embodiment shown but is to be accorded the widest scope consistent with the principles and features described herein.

The present invention provides a method and system for reducing storage and bandwidth requirements of a portable image capture device, such as the digital camera. Captured images, which are stored in image files, are transmitted to an online photo-sharing site for permanent storage, and the files of the uploaded images are reduced in size to reduce storage requirements. The uploaded images

are thereafter only referred to an image identifier during subsequent server communication, thereby eliminating redundancy in image transmission.

FIG. 1 is a block diagram illustrating a system for reducing the transmission bandwidth and storage requirements of a portable image capture device in accordance with a preferred embodiment of the present invention. The system will be explained in terms of a preferred embodiment where the image capture device is represented as a digital camera. However, one of ordinary skill in the art will readily recognize that any portable device capable of capturing images could be used, such as a cellphone or PDA equipped with a lens attachment, for instance.

The system includes one or more digital cameras 14 and an online photo-sharing service 16. The digital cameras 14 capture digital images and store the images on an internal memory. Because the digital cameras 14 have limited storage capacity, the digital cameras 14 are provided with the capability of uploading the captured images to the online photo sharing service 16, which has practically unlimited storage capacity. In a preferred embodiment, the cameras 14 are provided with wireless connectivity for connecting to the Internet, and are therefore called "web-enabled" devices, although a wired connection method may also be used. In one embodiment, the cameras 14 may connect to the Internet via a service provider 26, which may include a wireless carrier and/or an Internet service provider (ISP) that is capable of servicing many devices simultaneously.

The online photo-sharing service 16 includes a gateway server 18 for receiving the images and an image database 20 for storing the images. Once uploaded, the images may be stored in the user's account and organized into online web albums.

Once the images are stored at the photo-sharing site 16, the images may be viewed and managed over the Internet through a user's web browser 24.

Referring now to FIG. 2, a block diagram illustrating an example digital camera architecture is shown for use with the present invention. Preferably, the camera 14 includes a microprocessor-based architecture that runs an operating system 70 for controlling camera hardware 72 and overall functionality of the camera 14 (e.g., taking pictures, storing pictures, and the like). An example of such an operating system 70 is the Digita™ Operating Environment developed by the assignee of the present application. A memory 82, which may comprise flash memory or other type of non-volatile memory, is provided to store captured images as image files 80, explained further below.

The camera 14 also includes communication manager 74 software, and a TCP-IP protocol stack 76, that enables communication via the Internet, as is well-known in the art. The protocol stack 76, under direction of the communications manager interfaces with the communications hardware 78 of camera. The protocol stack 76 includes software APIs and protocol libraries that interface with the communication manager 74, and communication hardware interface drivers that interfaces directly with the various communications hardware 78 the camera 14 must function with (e.g., a Bluetooth transceiver, etc.).

The communications hardware 78 may provide wireless connectivity using anyone of a variety of methods. For example, a cellphone may be used to provide the digital camera 14 with wireless capability, where the camera 14 is connected to the cellphone via a cable or some short-range wireless communication, such as Bluetooth.

Alternatively, the camera 14 could be provided with built-in cellphone-like wireless

communication. In an alternative embodiment, the digital camera 14 is not wireless,

but instead uses a modem for Internet connectivity. The modem could be external or

internal. If external, the camera 14 could be coupled to modem via any of several

5   communications means (e.g., USB, IEEE1394, infrared link, etc.). An internal modem

could be implemented directly within the electronics of camera 14 (e.g., via a modem

ASIC), or alternatively, as a software only modem executing on a processor within

camera. As such, it should be appreciated that, at the hardware connectivity level, the

Internet connection can take several forms. Hence, it should be appreciated that the

10   present invention is not limited to any particular method of accessing the Internet.

The communication manager 74 communicates with operating system 70, the

IP protocol stack 76, and the communications hardware 78 to establish an Internet

connection and to transmit information and the image files 80 from the memory 82 to

the photo-sharing service 16.

15   FIG. 3 is a block diagram illustrating a diagram of one embodiment for an image

file 80. Image file 80 preferably includes a header 52, image data 54, a screennail 56,

a thumbnail 58, image tags 60, and an audio tag 62. Header 52 preferably includes

information that identifies and describes the various contents of image file 80. Image

data 54 contains actual captured image data, the resolution of which depends on the

20   settings of the camera 14. Image data 54 is typically stored in JPEG format, but may

exist in whichever format is appropriate for the current location of image file 80 within

the image processing chain of the camera 110. Screennail 56 and thumbnail 58 are

each different versions of image data 54 that have varying degrees of reduced

resolution for a number of special viewing applications. Image tags 60 include various types of metadata that correspond and relate to particular captured image data 54. Audio tag 62 stores any sound that has been recorded for the image.

The size of the image file 80 depends primarily on the size of the image data 54 and the audio tag 62, which are the largest components of the file 80. For a one-megapixel image, the image data 54 may be 200k-1M, the screennail 56 may be 20k, the thumbnail 58 may be 10k, the image tags 60 may be 1k, and the audio tag 62 may be 250k depending on the size of the sound clip.

As the resolution of digital cameras 14 continues to increase, the size of the image file 80 will also increase, requiring that the digital cameras 14 include higher capacity memories 80, which translates to higher camera cost. Besides the cost of the camera 14, the user 24 must also pay for the bandwidth required to transmit images to the photo-sharing site 16. Larger image sizes and the fact that the user may instruct the camera 14 to transmit a high-resolution image to multiple destinations translates to higher transmission bandwidth requirements and higher expense for the user.

Referring now to FIG. 4, a flow chart is shown illustrating the process for reducing storage and bandwidth requirements of the digital camera 14 in accordance with a preferred embodiment of the present invention. The process begins by assigning a respective image identifier (ID) 84 to each of the images uploaded to the server 18 in step 100. The image files 82 of each of the uploaded images are then optionally reduced in size on the digital camera in step 102. In response to a user request to apply an action to one of the uploaded images, the image ID 84 and the requested action are transmitted to the server 18 in step 104. According to the present

invention, because each image is uploaded to the server 18 only once and is thereafter reduced in size to save storage space, and only the image ID 84 is sent to the server 18, both storage requirements and transmission bandwidth required to send the image to multiple destinations from the digital camera are significantly reduced. In addition,

5   as image sizes increase, the amount of reduction in storage and bandwidth required will also increase, which will decrease digital imaging cost for the consumer.

The digital camera 14 operates in at least two operating modes: a capture mode for capturing images, and a play mode for displaying the previously captured images to the user. The captured images may be uploaded to the server 18 in any

10   of the operating modes, preferably as a background process. In one preferred embodiment of the present invention, the camera 14 automatically uploads captured images to the server 18 in capture mode. In another preferred embodiment, the captured images are displayed on the camera 14 in play mode, and the user may choose which images to are to be uploaded. Also in a preferred embodiment, the user

15   may also select actions to apply to the images, either before or after the images are uploaded.

The image ID's 84 may be assigned to the captured images by the camera 14 before uploading or by the server 18 after uploading. If the image ID's 84 are assigned by the camera 14, then the image ID's 84 are uploaded to the server 18 along with the

20   images. If the image ID's 84 are assigned by the server 18, then the server 18 assigns the image IDs 84 to the images after image uploading and returns the assigned Ids 84 to the camera 14. Receipt of the image IDs 84 by the camera 14 acts as acknowledgement of a successful upload and may trigger the reduction of the

corresponding image files in the camera 14.

In a preferred embodiment, the image files are reduced by deleting a portion of the file data. For example, the image data 54 may be replaced with the smaller screennail image 56, or the image data 54 may be made smaller through resizing and by then deleting the screennail image 56. By deleting or replacing the JPEG image data with screennail data, the size of the file is reduced dramatically, but sufficient image data exist to display the image to the user in play mode. In an alternative embodiment, the file may be deleted and replaced with just an alias, such as the file name. This results in the most space savings, but at the cost of not being able to show a representation of the image to the user.

FIG. 5 is a flow chart illustrating the process for reducing storage and bandwidth requirements of the digital camera in capture mode in a preferred embodiment of the present invention. The process begins by assigning an image identifier 84 (shown in FIG. 2) to each captured image in step 200. In a preferred embodiment, the digital camera names images using an incrementing count of the total number of images captured so that each captured image is provided with a unique name. The image identifier may then be created as a combination of the image name, and data identifying the camera 14, such as the camera serial number and/or the make and model of the camera 14. In a preferred embodiment, the image identifier (ID) 84 may be associated with the image by storing the image identifier 84 in the image file 80 as metadata, or in a separate file stored along with the image.

When an image upload is initiated, the digital camera 14 may display an action list to the user on the digital camera 14 in step 202 so the user may easily select what

actions the gateway server 18 should take with respect to the images by selecting the displayed action list items. Examples of action list items include specifying where the images should be stored and/or sent from a particular user or camera, such as sending the images to a list of email addresses for instance, or even performing some type of analysis or calculation on the image data.

FIG. 6 is a block diagram illustrating an example action list 48 displayed on the LCD screen of the camera 14. The action list 48 is shown displaying three major options; printing the uploaded images, saving the uploaded images in the user's personal space called a shoebox, and sending the images to Mom. Under the printing option, the user may select from various size prints. Rather than nested menu categories as shown under the printing option, the action list 48 may be displayed with each action listed as a separate item (e.g., "Send 4x8 prints to Mom", "Send 5x7 prints to me").

Referring again to FIG. 5, after the user selects one or more actions from the action list 48, the camera 14 begins transmitting the images image files 80 to the server 18 along with the image IDs 84 (unless the server provides the image IDs) and any selected actions chosen by the user in step 204. Transmitting the images necessarily includes first establishing a network connection with the server 18, and may also include identifying the users' account information.

After the images files 80 are transmitted, the digital camera 14 also marks each of the uploaded image files 80 as "sent" in step 206, preferably using one of the metadata tags 60. Next, the digital camera 14 generates the reduced image files by replacing or the high resolution image 54 with lower resolution data, such as the

screennail 56, and optionally deleting any audio tags 62 present in each of the of

uploaded image files 80 in step 208.   If the audio tag 62 has been deleted, then an

"audio present" tag is marked in the reduced image file for later retrieval in step 212.

The amount of image file reduction depends on the sizes of the data 54 and the audio

5   tag 62. However, for a one mega pixel image, generating the reduced image files

reduces the size of the image file 80 by 7-to-1. After the reduced image files have

been generated, the camera 14 may check whether a maximum number of images

files 80 are present on the camera 14 in step 214. If the maximum number of images

has been reached, then the oldest images may be deleted to further increase storage

10   capacity in step 216. If there are additional marked image files 80 in step 218, the

process resumes at step 208. An additional, optional tag may also indicate that

images are "protected", and thus not included in the list of potentially images to delete.

These "protected" images are those the use wants to keep in the camera, such as

family pictures, etc.

15   Once the uploaded images files 80 are received by the server 18, the server 18

stores the images in the image database 20 and indexes them by their image IDs 84.

The sever 18 also applies the requested action to the image files 80.

FIG. 7 is a flow chart illustrating the process for reducing storage and bandwidth

requirements of the digital camera in play mode. The process begins by displaying the

20   reduced images on the digital camera 14 for user selection in step 300. In a preferred

embodiment, the images are displayed with an indication that the images are reduced

and a muted sound icon is displayed if the audio has been deleted from the image file.

After the user selects one or more images, the user may choose an action to apply

to the image, as described above, in step 302. The image ID 84 for the selected image and the selected action are then transmitted to the sever 18 in step 304. If any of the selected images have not been previously uploaded, then they are appropriately ID'd and uploaded, as described above.

If the action selected by the user is to play the audio for the selected image in step 306, then the server 18 uses the image ID 84 to retrieve the audio tag 62 from the original image file 80 in step 308. The server 18 then downloads the retrieved audio tag 62 to the camera 14 in step 310, and the camera 18 plays the audio in step 312. The process of downloading the audio may take some time. Therefore, the user is preferably given the option of canceling the action at any time. In an alternative embodiment, the server re-encodes the audio into a higher compression format using an asymmetric system, such as MP3, which requires much more processing power to encode than to decode. This will make the audio tag much smaller for subsequent download, and can still be played in-camera with no noticeable loss of quality.

If the action selected by the user is to send the selected image from the camera 14 to another device in step 314, then the server 18 uses the image ID 84 to retrieve the original image data in step 316. The server 18 then downloads the retrieved image data to the camera 14 in step 318, and the camera 18 sends the image data to the device in step 320. In an alternative embodiment, the camera 14 may send the reduced image to the other device along with a password so that the device may download the original image data from the server 18. This feature may be very useful for Internet-enabled printers, where the reduced image is sent to the printer and the printer prints with full resolution even though the full resolution image was not actually

sent from the camera. This feature can also be implemented via a "signature" key in the metadata, using public key encryption.

If the action selected by the user is to send the selected image from the server 18 to another destination in step 322, then the server 18 uses the image ID 84 to retrieve the original image file 80 in step 324, and sends the image file 80 to the specified destination in step 326.

If the user changes the image tags in the reduced image file in step 328, then the tags are transmitted to the server 18 in step 330 for synchronization. The server 18 then uses the image ID 84 to store the tags in the original image file 80 in step 332.

If the action selected by the user is a request to delete the selected image in step 334, then the user may be prompted in step 336 whether the user wants to delete the reduced image only or wants to delete both the reduced image and the original image file 80. If the user chooses to delete the reduced image, then the reduced image is deleted from the camera 14 in step 338. If the user chooses to delete both the reduced image and the original image file 80, then the reduced image is deleted from the camera 14 in step 340 and the server 18 uses the image ID 84 to delete the original image file 80 in step 342. Ideally, rather than use the same word "delete" for both types of actions, "delete" would only be used for eliminating the image entirely, and some other word, such as "purge" or "remove" would be used to delete the local reduced copy.

If the action selected by the user is to view the original image data in step 344, then the server 18 uses the image ID 84 to retrieve the original image data in step 346, and downloads the image data to the camera 14 in step 348. The camera then

displays the image in step 350. Since the camera LCD or video output is typically significantly lower resolution than the image, the only possible use on the camera 14 is when the user wants to magnify the image significantly, such that the reduced image resolution is not sufficient (such as 4x magnification). Alternatively, a desired resolution can be requested, and the server can resize and download the requested reduced resolution - which is significantly smaller than the full resolution, but significantly larger than the in-camera version. This would also reduce bandwidth requirements.

In a preferred embodiment, the user may also want to view a group of images, which are specified by a date range and or by category which are no longer in-camera. The search criteria would then be sent to the server with the ID of the camera and/or user and the server would use the search criteria to search for matching images taken by the identified camera/user. To speed transmission, the server 18 could return the thumbnail images to the camera 14 as the search results for the user to browse. When the user finds the image(s) he is looking for, a reduced copy of the image can be then downloaded.

A method and system for reducing the storage and transmission bandwidth requirements of a digital camera has been disclosed. According to the present invention, captured images are automatically uploaded to a server and the large image files are reduced in size in the camera to reduce storage requirements. If the user wishes to apply further actions to a previously uploaded image, then the camera only sends the image ID of the image to the server, thereby reducing transmission bandwidth.

Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit and scope of the present invention. Accordingly, many modifications may be made by

5   one of ordinary skill in the art without departing from the spirit and scope of the appended claims.

CLAIMS

What is claimed is:

1   A method for reducing transmission bandwidth requirements of a portable image capture device, the image capture device including means for establishing a communications connection on a network, the method comprising the steps of:

    (a)   assigning an image identifier to captured images uploaded to a server on a network, wherein each of the images are stored in an image file, each of the image files having a particular size; and

    (b)   in response to a user request to apply an action to one of the uploaded images, transmitting the image identifier of the image and the requested action to the server, thereby eliminating the need to retransmit the image and reducing transmission bandwidth.

2   The method of claim 1 further including the step of:

    (c)   reducing the size of each of the image files corresponding to the uploaded images on the image capture device, thereby reducing storage requirements.

3   The method of claim 1 wherein step (a) further includes steps of:

    (i)   uploading the image identifiers with the captured images.

4   The method of claim 2 wherein step (c) further includes step of:

      (i)   deleting at least a portion of each of the image files.

5   The method of claim 4 further including the step of storing each of the captured images in an image file that includes a high resolution image, a reduced resolution image, and audio, wherein step (b) further includes the step of:

      (ii)   replacing the high resolution image with the reduced resolution image.

6   The method of claim 5 wherein step (c) further includes the step of:

      (iii)   deleting the audio if audio has been recorded for the image.

7   The method of claim 6 wherein step (c) further includes the step of:

      (iv)   if the audio has been deleted, then marking an "audio present" tag in the reduced image.

8   The method of claim 1 further including the step of:

      (c)   replacing each of the uploaded images with an alias that includes the image identifier assigned to the uploaded image.

9   A method for reducing bandwidth requirements of a portable image capture device, the image capture device including means for establishing a communications connection on a network, the method comprising the steps of:

(a)   assigning an image identifier to a captured image;

(b)   transmitting the image and the image identifier from the image

capture device to a server on the network for storage;

(c)   marking the image as sent in the image capture device;

(d)   in response to a user request to perform an action on a selected

image, determining if the selected image is marked; and

(e)   if the selected image is marked, uploading the image identifier to the

server, wherein the server performs the action on the image identified

by the image identifier, thereby eliminating the need to retransmit the

image.

10   The method of claim 9 further including the step of reducing storage

requirements of the image capture device by:

(f)   deleting the image from the image capture device.

11   The method of claim 9 further including the step of reducing storage

requirements of the image capture device by:

(f)   replacing the image with a reduced image on the image

capture device, the reduced image having a size substantially less than the size of

the image.

12   The method of claim 11 further including the step of storing the image in an

image file that includes a high resolution image, a reduced resolution image, and

audio, wherein step (f) further includes the step of:

    (i)   deleting the high resolution image and the audio if audio has been recorded for the image.

13   The method of claim 12 wherein step (f) further includes the step of:

    (ii)   if the audio has been deleted, then marking an "audio present" tag in the reduced image.

14   A system for reducing storage and bandwidth requirements, comprising:

an online photo-sharing service for receiving digital images over a network; and

an image capture device for capturing digital images, the image capture device including,

means for establishing a network connection,

means for assigning an image identifier to each of the digital images;

means for transmitting the digital images and the respective image identifiers from the image capture device to the server for storage;

means for marking the digital image as sent;

means responsive to a user requests to perform an action on a selected image for determining if the selected image is marked; and

means responsive to the selected image being marked for uploading

the selected image's image identifier and the action to the

server, thereby eliminating the need to retransmit the image.

15   The system of claim 14 wherein each of the digital images are stored in the

image capture device as an image file, each of the image files including image

data, reduced resolution image data, and metadata tags.

16   The system of claim 15 wherein each of the transmitted digital images are

replaced with reduced image files on the image capture device by deleting the

image data from the image file.

17   The system of claim 16 wherein the images files further include an audio

clip, the audio clip also being deleted when generating the reduced image files.

18   The system of claim 17 wherein when the reduced image files are

generated, the image capture unit determines whether a maximum number of

images files are present, and If the maximum number of images has been reached,

then the oldest images are deleted to further increase storage capacity.

19   The system of claim 14 wherein once the server receives the image identifier

and the action, the server applies the action to the digital image identified by the

image identifier.

20   The system of claim 19 wherein the server uses the image identifier to index and store the digital image.

21   The system of claim 20 wherein if the action requires retrieving the stored image, the server uses the image identifier sent with the action to retrieve the stored image.

22   A method for reducing storage and transmission bandwidth requirements of a portable image capture device, the image capture device including means for establishing a communications connection on a network, the method comprising the steps of:

(a)   receiving captured images uploaded from the image captured device to a server on the network;

(b)   assigning an image identifier to the uploaded images by the server;

(c)   downloading the image identifiers to the image capture device for association with the corresponding uploaded image; and

(d)   receiving a request from a user to apply an action to one of the uploaded images, wherein the request only include the image identifier of the image and the requested action, thereby eliminating the need to retransmit the image and reducing transmission bandwidth.

23   The method of claim 22 wherein step (c) further includes the step of:

    (i)   sending the image identifiers to the image capture device to acknowledge receipt of the uploaded images.

24   The method of claim 23 wherein each of the images are stored in an image file, each of the image files having a particular size, step (c) further including the step of:

    (ii)   after receiving the image identifiers on the image capture device, reducing the size of each of the image files uploaded to the server, thereby reducing storage requirements.

25   The method of claim 24 wherein step (c) further includes the step of:

    (iii)   reducing the size of each file by deleting at least a portion of the image file.

26   The method of claim 25 wherein step (c) further includes the step of:

    (iv)   reducing the size of each file by deleting audio from the image file.

27   The method of claim 26 wherein step (d) further includes the steps of:

    (i)   receiving a request from the user to listen to audio corresponding to the uploaded image;

    (ii)   using the uploaded image identifier to retrieve the audio

corresponding to the uploaded image; and

(iii)   downloading the retrieved audio to the image capture device

for playing.

5   28   The method of claim 27 wherein step (d) (ii) further includes the step of:

(i)   encoding the audio into a higher compression format on the

server to make the audio smaller for downloading and playing,

but without a noticeable loss of quality.

10   29   The method of claim 22 wherein step (d) further includes the steps of:

(i)   receiving a request to download a selected image;

(ii)   using the image identifier to retrieve the selected image; and

(iii)   downloading the selected image.

15   30   The method of claim 29 wherein step (d) (i) further includes the steps of:

(1) receiving a password with the selected image; and

(2) only retrieving the selecting image if the password is verified.

31   The method of claim 29 wherein step (d) (i) further includes the steps of:

20   (1) receiving a signature key with the selected image; and

(2) only retrieving the selecting image if the signature key is verified.

32   The method of claim 22 wherein step (d) further includes the steps of:

      (i)   receiving a request to delete a selected image; and

      (ii)   determining on the image capture device if the uploaded image

           on the image capture device should be deleted along with the

5   selected image on the server.

ABSTRACT

A system and method for reducing storage and transmission bandwidth requirements of a portable image capture device capable of establishing a communications connection on a network is disclosed. The method aspect of the present invention include assigning an image identifier to captured images uploaded to a server on a network, wherein each of the images are stored in an image file having a particular size. The size of each of the image files corresponding to the uploaded images on the image capture device may then be reduced, thereby reducing storage requirements. In response to a user request to apply an action to one of the uploaded images, only the image identifier of the image and the requested action are transmitted to the server, thereby eliminating the need to retransmit the image and reducing transmission bandwidth requirements.
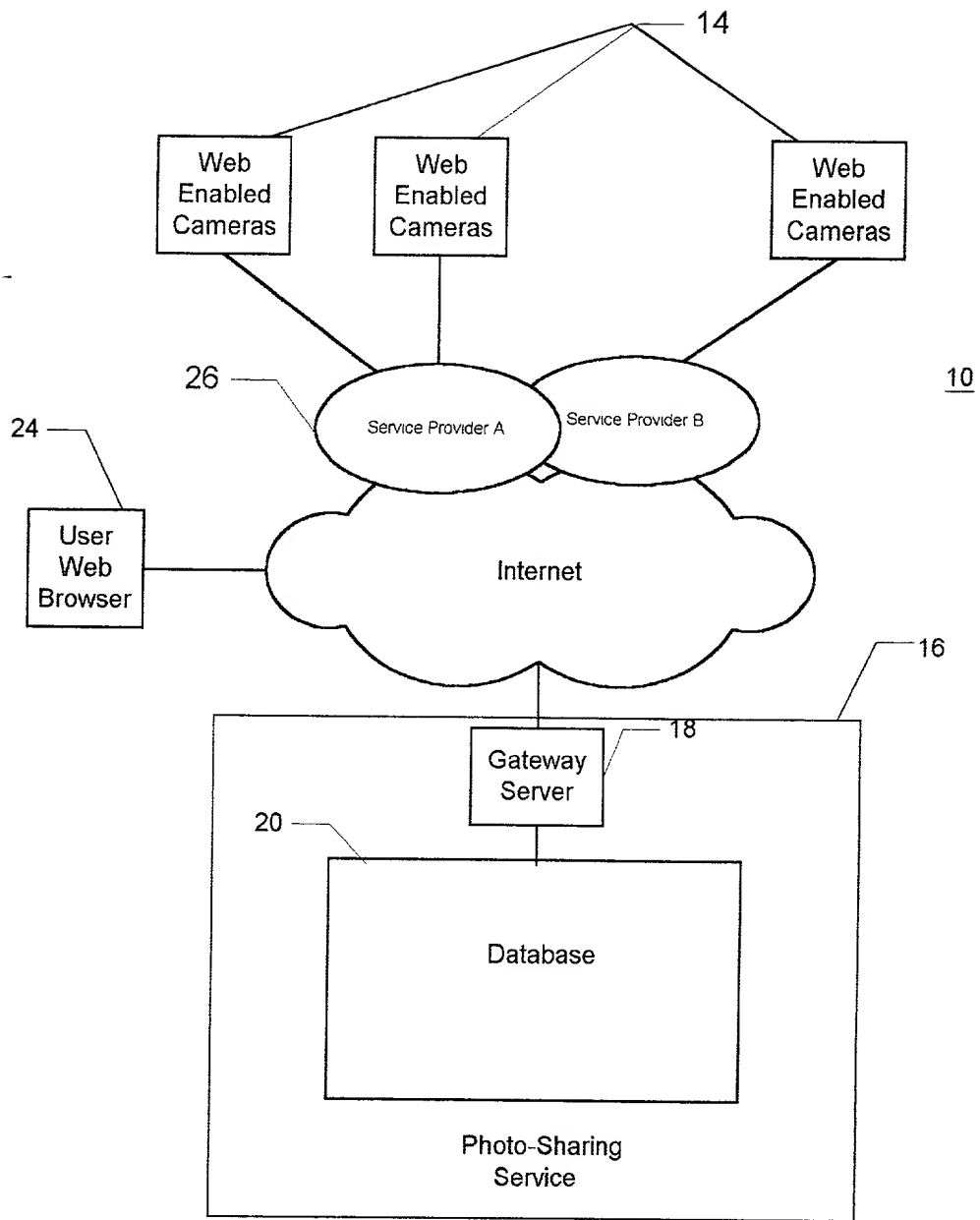
5

10
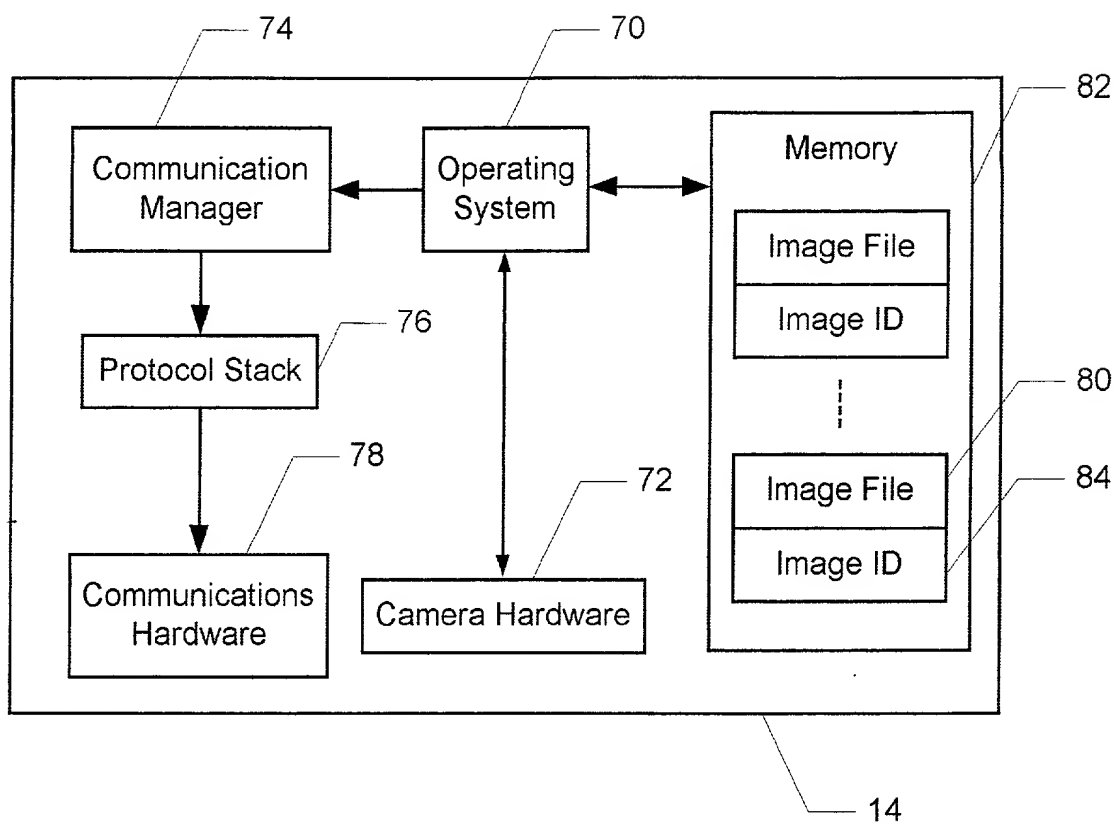
14

Web
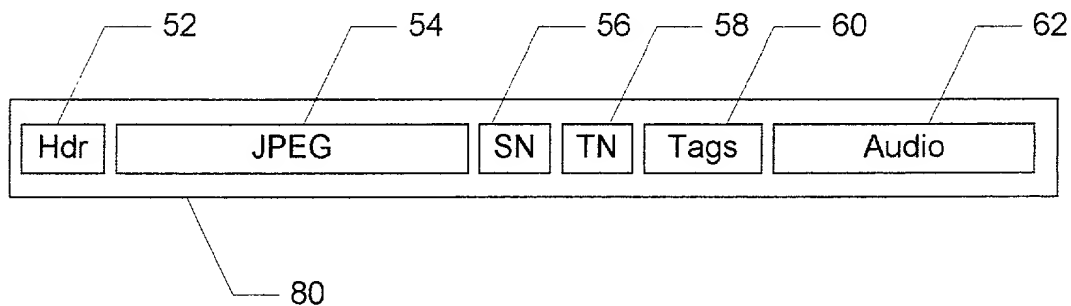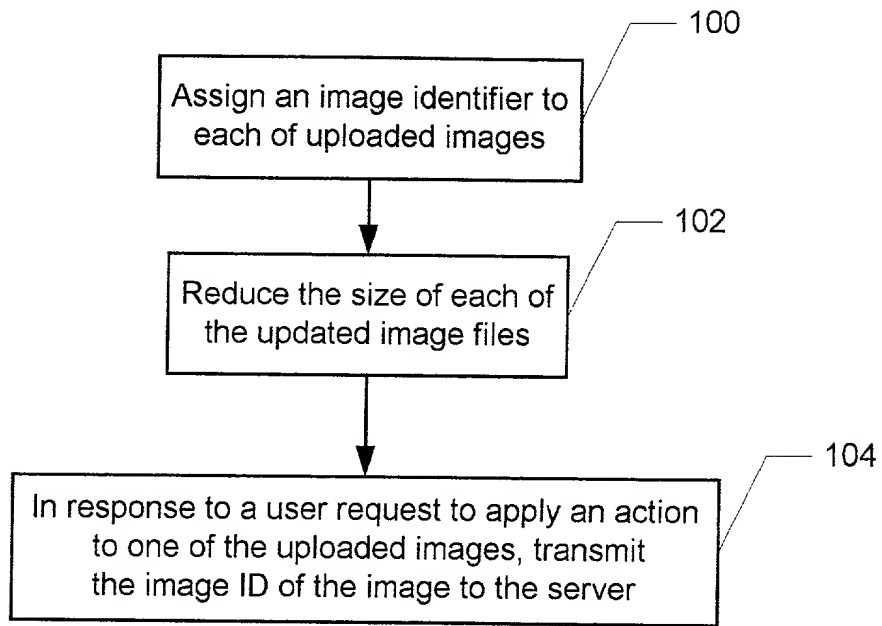Enabled
Cameras

Web
Enabled
Cameras

Web
Enabled
Cameras

26

24

10

Service Provider A

Service Provider B

User
Web
Browser

Internet

16

Gateway
Server

18

20

Database

Photo-Sharing
Service

FIG. 1

FIG. 2

FIG. 3

```
                                                    ┌─── 100
        ┌─────────────────────────────┐ ╱
        │  Assign an image identifier to │
        │    each of uploaded images    │
        └─────────────────────────────┘
                      │
                      ▼                 ┌─── 102
        ┌─────────────────────────────┐ ╱
        │  Reduce the size of each of │
        │    the updated image files  │
        └─────────────────────────────┘
                      │
                      │                            ┌─── 104
                      ▼                            ╱
  ┌──────────────────────────────────────────────┐
  │  In response to a user request to apply an action │
  │     to one of the uploaded images, transmit     │
  │     the image ID of the image to the server     │
  └──────────────────────────────────────────────┘
```

FIG. 4

Assign an image identifier to each captured image — 200

Display an action list for user selection — 202

Transmit the images image files to the server along with the image identifiers and any selected actions — 204

Mark each of the uploaded image files as "sent" — 206

For each marked image file, generate reduced image file by replacing high-resolution image data with lower-resolution image data and deleting the audio tag — 208

If the audio tag is deleted, mark an "audio present" tag — 212

More image files ? — 218

Max no. of images ? — 214

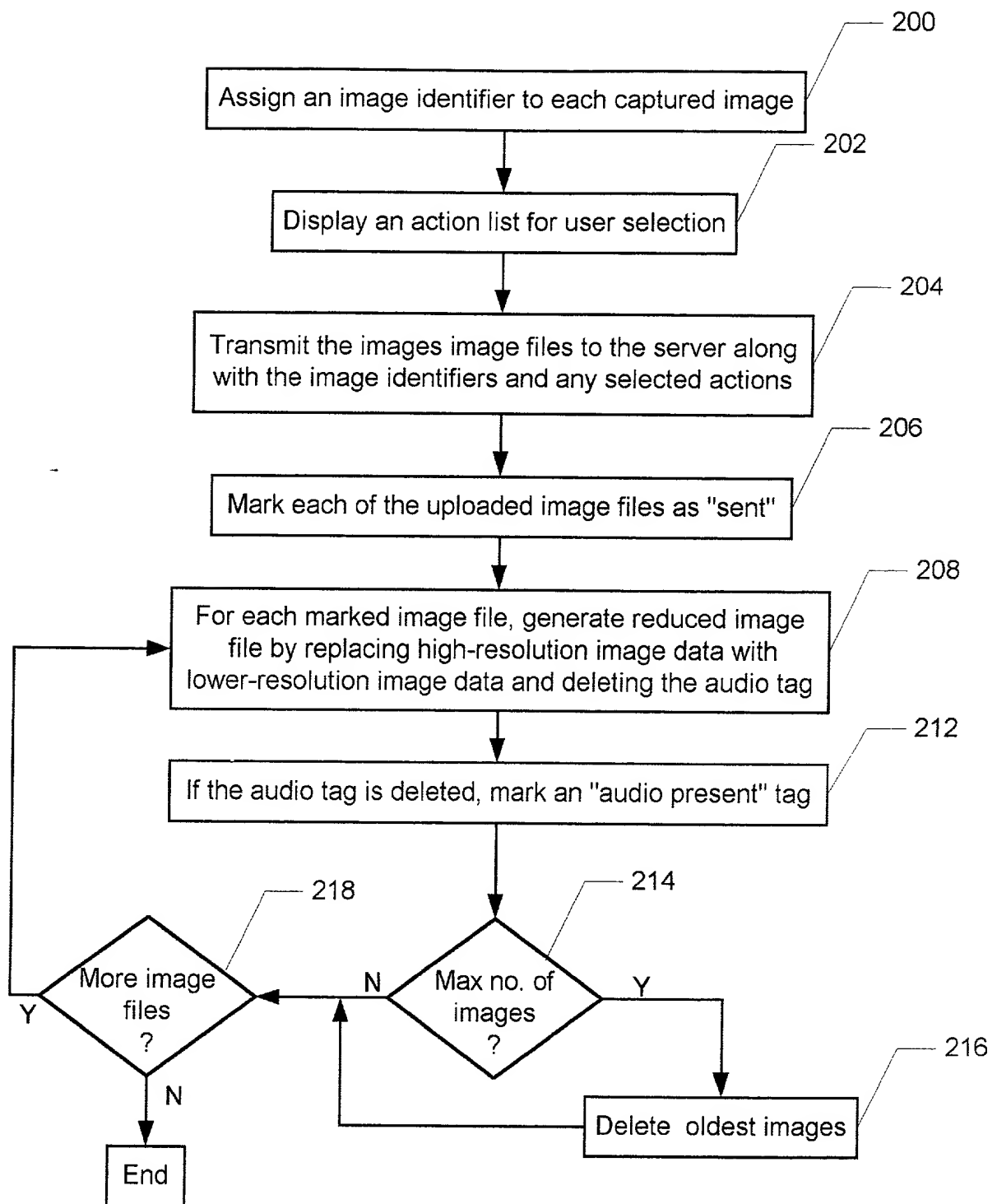Delete oldest images — 216

N

Y

N

Y
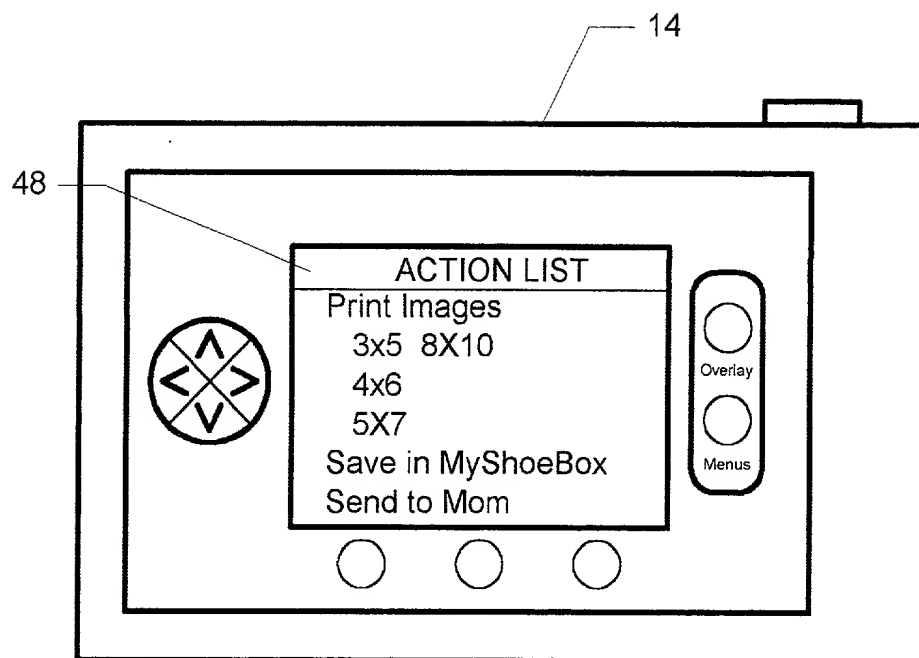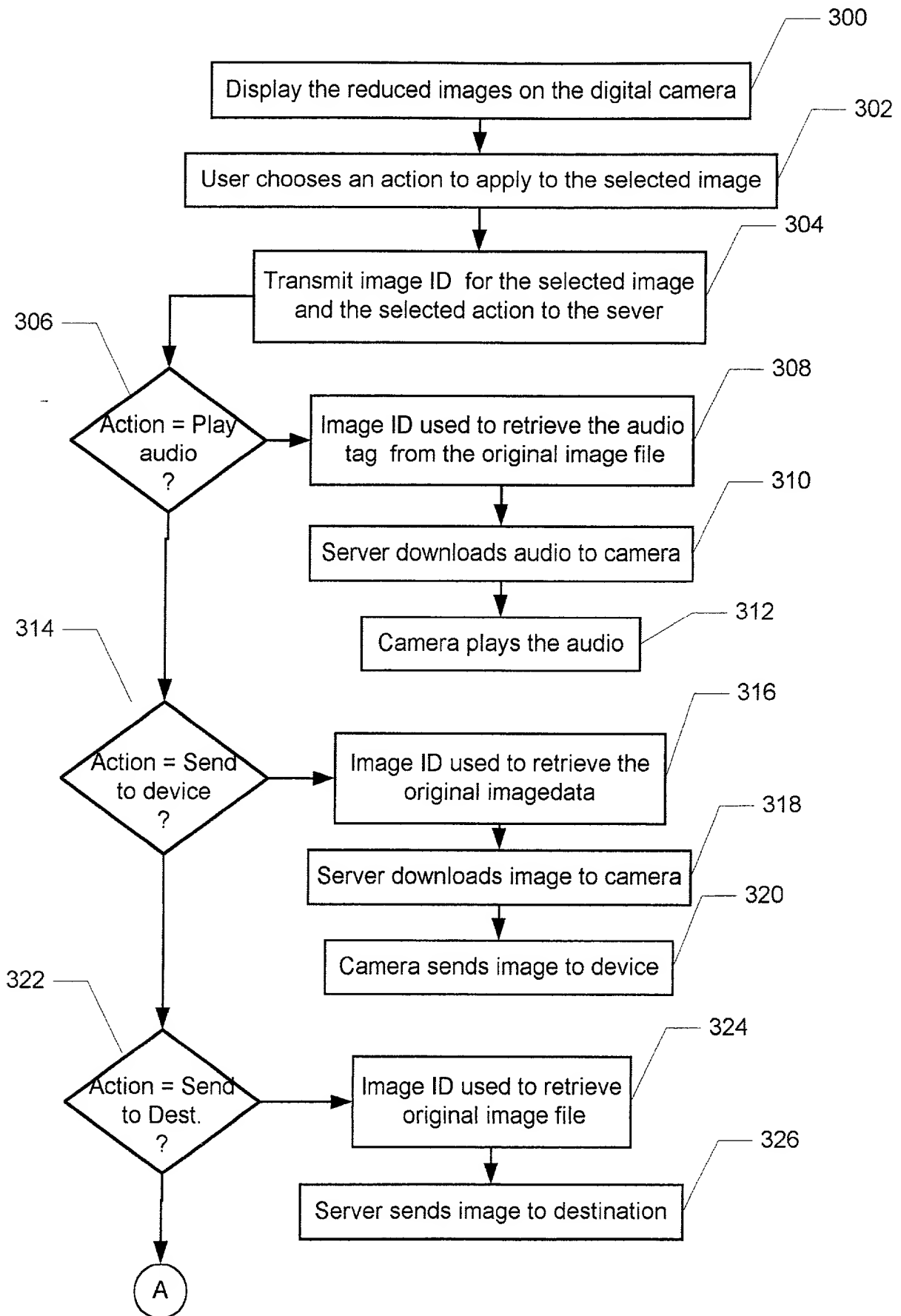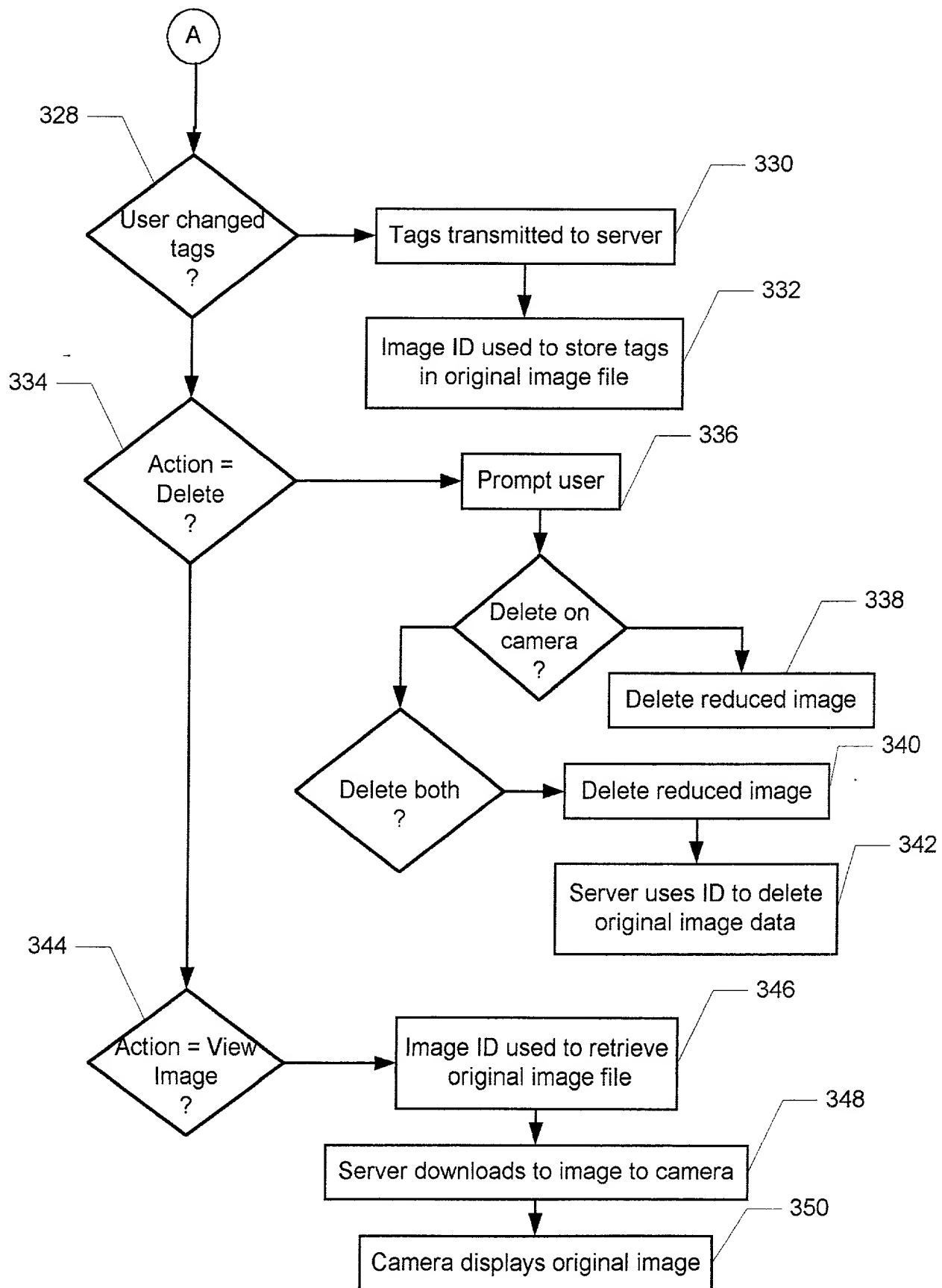
End

FIG. 5

FIG. 6

FIG. 7A

FIG. 7B

DECLARATION AND POWER OF ATTORNEY FOR **UTILITY** PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name,

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

TRANSMISSION BANDWIDTH AND MEMORY REQUIREMENTS REDUCTION IN A PORTABLE IMAGE CAPTURE DEVICE

the specification of which

    __x__ is attached hereto.
    ____ was filed on _____ .

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I do not know and do not believe that the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and said invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56 (a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)   Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)

I hereby appoint Joseph A. Sawyer, Jr., Reg. No. 30,801; Stephen G. Sullivan, Reg. No. 38,329; Janyce R. Mitchell, Reg. No. 40,095; Michele Liu, 44,875; and Wendell J. Jones, Reg. No. 45,961, Doretha L. Robinson, Reg. No. 45,048, of **SAWYER LAW GROUP** LLP, located at **2465 E. Bayshore Rd., Suite 406, Palo Alto, California 94303, telephone (650) 493-4540**, as my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Address all telephone calls to **Mr. Joseph A. Sawyer, Jr.** at telephone number **(650) 493-4540** and all correspondence to:

<div align="center">

SAWYER LAW GROUP LLP
P.O. Box 51418
Palo Alto, California 94303

</div>

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of first/sole Inventor: **Eric C. Anderson**

Residence Address:

931 Brentwood Avenue			
San Jose	**Santa Clara**	**California**	**95129**
Street Address	County	State	Zip Code

Post Office Address: **SAME**

Country of Citizenship: **United States of America**

_____10/6/00_____
Date

_____E C Anderson_____
Signature